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ABSTRACT

A study examined 49 students' use of distance education (DE) technology in a telecommunications course about the social and economic impacts of information technology. The originating site was a specially equipped television studio on the home campus. Aside from study guide readings, students wrote reaction journals and a paper about an information professional, kept a log of information-related articles, evaluated an information retrieval exercise using databases, and wrote a take-home final. The course was delivered via 2-way audio, one-way video teleconferencing for 5 weeks; for the remaining 10 weeks, all students (except 3 distant-site students) were connected by 2-way video conferencing technology. Students used an asynchronous computer conferencing system that allowed collection of their writings, and submitted most assignments via email, computer conferencing, or fax. Results of data analysis indicated that, although students were not hesitant about speaking in front of the people in their own room, they hesitated to speak in front of the entire class. Findings revealed that students' communication anxiety, measured at the beginning and the end of the course, showed a change in mean response indicating an increase with this technology. However, many seemed to feel no restraint in voicing comments and often seemed more like they were watching television than attending a class. With no instructor in the room, they seemed to find it difficult to apply the "rules" of the classroom to DE. (Contains 1 table of data and 52 references.) (CR)

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Building Communication Environments in Distance Education

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ABSTRACT

Since the earliest days of educational media, researchers have struggled to develop a theory of formal learning from media. The latest field to pursue this is distance education (DE). This multi-methods analysis of a telecommunications course argues that DE theories would be better served if they focused more on the fundamental changes that distance technology brings to classroom communication. A constructivist perspective is offered that calls for a guided approach to interaction at a distance.

The Information Age is by no means short on promising rhetoric. Citizens worldwide have been promised all manner of conveniences and thrills through their televisions, telephones, and computers. Nowhere has this been more strongly stated than in education, particularly in the move toward distance learning. As the nation's public colleges and universities reach out to the national and global community, they find that distance education is one means of establishing contact with new student populations and larger societies.

From its beginnings in correspondence study and educational radio/television, distance education has struggled to find a theoretical model that can adequately account for the nature of distance learning, the types of people attracted to such courses, and the technologies that mediate this experience. Distance education researchers have had a difficult time understanding students' learning experience. Only recently has work on the interaction between and among participants been suggested and initiated. Until the late 1980s, no models thoroughly accounted for the nature of interaction in distance courses. Initial theories were borrowed and adapted from several intellectual fields, including psychology, sociology, and communication.

The intent of this paper is to explore what should be one of the fundamental elements of any distance education theory--instructional communication. In traditional models of classroom learning, communication is a formal, rule-governed process that dictates the content and process of interaction. Distance learning, however, presents fundamental breaks with this model. After a review of several theoretical models, we outline a constructivist perspective that focuses on the changing demands distance technology places on communicative and learning environments. We argue that communication in any classroom, particularly the distant one, is a fundamental part of education. The nature of communication creates a learning atmosphere that can enhance or devalue the experience for all involved. Our study of one course delineates three factors that influence the quality of this environment: the patterns of person-

to-person communication in class, the "on stage" nature of class participation, and the conflict of classroom vs. television viewing norms during class meetings.

Theoretical Models of Distance Education

Since the earliest days of educational radio, theories of learning, instruction, and communication have been at work in distance education, either implicitly or explicitly. While many theoretical models have been proposed, a few have received considerable attention and are briefly described here.

Correspondence Model

One of the earliest models of distance learning evolved from correspondence-school courses delivered by mail, radio, and/or television. The original concept of this model is based on early 20th century efforts to deliver instructional material to residents of rural and remote locales. While many of these courses were offered by commercial companies promising increased vocabularies, speed-reading skills, or expertise in electronics, many educational institutions initiated their own programs when mass media offered them the promise of reaching millions of potential learners. Common to all of these courses is a physical separation of learner and instructor and a limited means of exchanging information. Printed texts, instructional materials, and course work were usually delivered by mail. Mass media made it possible for audio and video broadcasts and/or tapes to deliver lessons, but the chief form of two-way interaction, postal correspondence, remained rather slow.

This model of distance education has also been labeled an "autonomous" or "independent" model (Keegan, 1988). The logistical and instructional design placed much of the impetus for learning on the student, putting a premium on his/her motivation for success. In the United States, this model became part of a liberal, pluralist ideology which argued that all citizens should be given access to education. Self-paced and individually tailored instruction was a hallmark of this philosophy. Students were allowed to pursue their own instructional goals and activities in convenient times and locations, free of institutional constraints (Wedermeyer, 1974).

Industrial / Functionalist Models

The application of mass media to education inspired another model of distance education based on economic models of production (Peters, 1971, 1988). Broadcast technology made it possible to deliver instruction to a vast audience wherever a radio or TV signal could be received. A model of industrial and economic efficiency, some argued, was best suited to the analysis of such education. This model holds that traditional theories of instruction are inadequate for teaching based on technical forms of communication (Peters, 1973). The most important aspects of instruction in this model are a careful, scientifically planned course design, a standardization of instructional materials, and formalized procedures of evaluation/assessment.

A strong influence on this model is the highly technical nature of distance education. Research on the application of new technologies and "prototype" distance courses drew on work in a variety of areas, including marketing, organization studies, quality control research, and management information systems (Woodley, 1993). A second influence here, of course, is the political and economic environment in which distance education efforts are organized. Under strong scrutiny by both government and business, higher education has turned to distance learning as a way to meet the demands of the workplace and individuals who want to "retrain" and "retool" for changes in employment markets.

Another version of this approach is the service-industry model. Sewart (1988) has argued that pre-packaged materials cannot perform all the functions of an instructor and peer-group in the traditional classroom. The physical and temporal separation in distance courses places students at a disadvantage in gaining instructor feedback and support on their progress. Thus, the educational institution must provide support services to respond to the myriad academic, financial, administrative, and personal problems faced by distant students. In this way, research on total quality management (e.g., Bruce, 1992; Maki & Nightingale, 1992; Nunan, 1992), student support services (e.g., Dillon, Gunawardena, & Parker, 1992; Hezel & Dirr, 1991; Robertson, 1993; Sewart, 1993), and a learner-centered model of distance education

all stem, at least in part, from a philosophy that learners require services beyond acess to content and the instructor if distance education is to flourish.

Recent research on distance education has also produced a functionalist model that sees distance education efforts as part of a larger social system. Saba (1988, Saba & Twitchell, 1987) has argued that distance learning is best viewed through a systems perspective. This model holds that education is a response to social and economic problems of the larger society. It is heavily influenced by Moore (1986; 1988), who has argued that distance learning systems can be typed according to the independence and autonomy that technical and instructional designs create for distance learners. The model uses computer modeling techniques to identify problems within a causal-loop diagram. This diagram is used to delineate the functions of a distance learning system and the policy options available to address the problem. The educational program's success or failure reflects its ability to address these systemic problems.

Media Models

Theoretical research on learning provided little insight that addressed the very different context of distance learning. As a result, distance education research turned to other fields for theoretical approaches. The use of mass media, particularly television, suggested that mass communication research could provide useful theoretical concepts (Bates, 1982; Miller, McKenna, & Ramsey, 1993). Kozma (1991) outlined two perspectives here: conduit theory and interaction theory. Conduit views of distance technology see the medium as only a vessel for information or a virtual meeting place for class participants. Miller, McKenna, and Ramsey (1993) argued that two questions drive such research: 1) does the technology inhibit teacher-student communication, and 2) are remote and local students equally attentive or engaged in the course? This quasi-experiment did not provide positive answers to these questions.

These authors, however, did point to a second model that seems relevant, Salomon's (1983) notion of invested mental effort in learning from various educational media. This line of research argued that

students' preconceptions of a particular medium influence how easy or tough they perceive instruction to be through that medium. Thus, if television were perceived as an "easy" medium, students would invest less mental effort in instruction and, consequently, learn less from it. Some support has been offered in experimental work on this concept (Beentjes, 1989; Salomon, 1984). In general, print media have been linked to increased student achievement, suggesting some disadvantages in the use of television. The influence of these preconceptions and expectations about mediate learning is a compelling bridge of communication and learning theory.

Interaction Models

Other authors have argued that distance education theory should focus primarily on the interaction between teachers and students (Holmberg, 1988; Perraton, 1988; Shale & Garrison, 1990). While many consider the lack of face-to-face, immediate interaction the most defining element of distance education, the models above do not focus on the consequences of this for learning. Baath (1979; 1982), in a series of studies, explored ways to provide for two-way interaction within printed course materials and emphasized the importance of one-to-one interaction through any available technologies. Holmberg's (1988) didactic model stresses the importance of an ongoing "conversation" between teacher and student in distance courses. These conversations can be real (in person or via technology) or simulated (via one's writing style in print materials) and form the core of one's learning in any situation. Likewise, Perraton (1987, 1988) stresses the importance of dialogue in education. Aside from merely mimicking the role of a traditional classroom teacher, the distance instructor must be able to help students handle information from a variety of outside sources. Perraton also stresses the importance of group-based activity and multimedia delivery designs in distance courses. Shale and Garrison (1990) argue that all education is characterized by two-way interaction. It is most effective when this interaction is an ongoing dialogue of information sharing and negotiation of meaning (Larsen, 1986; Rowntree, 1975; Smith, 1988).

Constructivist Perspectives on Learning & Communication

One of our principal arguments is that communication practices build an environment which can either encourage or inhibit learning. One theoretical perspective that highlights this learning environment is constructivism. Though this is becoming one of the most overused terms in learning research, this perspective offers distance education research an opportunity to examine communication in a unique social and educational setting. Here we highlight a few relevant constructivist concepts that apply to learning and communication in a distance course.

Though several separate learning and cognition theories are now included under the term "constructivist," Duffy and Cunningham (in press) argue that they share two common premises: 1) that learning is an active process of constructing rather than acquiring knowledge, and 2) that the instructional process supports that construction rather than transmitting knowledge directly into students' heads. These commonalties underscore the importance of the total learning environment, or context, in learning research. Rather than a narrow focus on accurate transmission of an objective body of knowledge, constructivist learning theory holds that students create and maintain their own meanings from the information they gather (Duffy & Cunningham, in press; Wagner & McCombs, 1995). These meanings are either more or less valid, depending on how other participants judge them. Thus, there is no "match" in meaning between instructors and students, but an understanding of where their multiple perspectives meet and diverge.

This challenges classroom instructors to assume a facilitory role (as Perraton suggests) rather than the usual stance as ultimate authority on content material (Burge, 1994). Several authors have offered instructional concepts and strategies that exemplify this role. One is the notion of **scaffolding** (Wood, Bruner, & Ross, 1976), which holds that instructors guide students through their initial encounters with content material, engaging them in interactive learning that demonstrates how one might work with new knowledge. Once the student develops some skill and confidence, the instructor's guidance is gradually

removed, leaving the student to finish the job of creating and maintaining meaning. A second relevant notion is the idea of **reciprocal teaching** (Palinscar & Brown, 1984), which suggests that instruction can be just as effective when students guide and teach each other--with no overt assistance from instructors. Students are "trained" to serve as models for other students, enabling them to learn in independent groups and, eventually, take control of their own learning. Both concepts point to a shift in the power relationships of traditional classroom education, making students capable and responsible sources of learning and information.

Duffy's and Cunningham's arguments highlight a similar shift in the conception of communication from "transmission" to "ritual" models (Carey, 1989). Rather than seeing messages as linear transmissions from one source to a receiver, many see communication as a co-construction of meaning among participants. In this view, communication is seen as a series of events that allows participants to build and maintain cultural meanings for ideas and events. Bourdieu (1990) stresses the importance of **communication practice** in this process. Routine practices like greeting others, taking turns in a conversation, and even phrasing questions to a teacher, are seen as revealing of cultural, social, and psychological meanings for people, events, objects, and concepts. Competence in such practices has been applied in distance education research (Lorentsen, et al., 1989) to address the lack of a "common communication etiquette" when distance technologies are used to deliver instruction.

The principal feature of the interaction models of distance education (describe above) is that they suggest a focus on communicative practice. Traditional classroom education engrains a set of unique communication practices within students. For example, students quickly learn how to gain attention during class, how to speak with the instructor before and after class, and what constitutes appropriate speech inside and outside the classroom. Students also develop a sense of how others are doing in the course and the relationship that the class as a whole shares with the instructor. Constructivist models of distance learning are best suited to examining this environment and each participant's perception of the

learning process. In fact, some research (e.g., Sponder, 1991) indicates that constructivist and collaborative learning strategies are quite effective at bridging the perceived distance between teachers and students.

A second important feature, then, is the effects of different distance technologies on communicative practice in the distance course (Miller, McKenna, & Ramsey, 1993). The use of two-way audio and video conferencing, fax machines, and computer conferencing systems each introduce new opportunities and constraints on interaction. The practices at work in a traditional, face-to-face environment obviously change. To date, however, few studies have examined these changes for their influence on classroom communication. This study explores the consequences of changing classroom communication practice for the learning environment of a distance course. Our questions include:

1. What patterns of communication behaviors can be observed with distance technologies?
2. How do these behaviors contribute to the learning environment within the classroom?
3. How do students perceive both these practices and the learning environment?

Concepts and Variables of Interest

These models have also provided a variety of conceptual definitions of "distance." The most obvious uses of the term have referred to the physical and/or temporal separation of teacher and student. The correspondence model especially emphasized these dimensions, making the bridging of such gaps a high priority in distance education (Keegan, 1988). As distance learning involved more complex situations and technologies, research (e.g., Schuemer, 1993) turned to studies of the psychological factors affecting learning (e.g., student achievement, drop out rates, attitudes toward distance education). These studies highlighted the psychological distance between instructors and learners. Many fit well within some of the service and interaction models described above. Another important aspect of learning, though, is the social environment of the classroom. This environment is the learning culture of a distance course, which includes not only the work ethic that develops among course participants, but also the social familiarity

that evolves over time during many college classes. Participants who get to know one another develop a sense of "belonging" to the class. It is this dimension of distance education we choose to emphasize as the foundation of learning.

The concepts of greatest interest to this study are also those that are most difficult to define outside the context of a particular distance course. Our interest in participants' communication practices and learning environment of the class render any prior designation of relevant events and objects pointless. This study is most concerned with the ways in which participants co-construct this environment. Hence, we were most interested in three aspects of interaction in this course. First, we wanted to get a sense of how students and instructors conducted their interactions with one another, particularly during class meetings. This included, but was not limited to, observations of how participants accomplished the kinds of tasks discussed above (e.g., gaining the teacher's attention, interacting with other students about the course). A second focal area for this study included the types of collaborative and reflexive learning associated with constructivist learning theory. Specifically we looked for instances in which students, formally or informally, shared information from their research and/or course work with one another. Ample opportunity for such sharing was built into the course when students were assigned in groups to each of the special topics on information technology (e.g., telecommuting, distance education, privacy issues). Students were also encouraged to share research information relevant to other course work (provided that written assignments were their original work).

At the same time, however, other variables will influence students' attitudes toward and use of distance technologies. These included students' willingness to communicate with others, their willingness to use information technologies, their previous experience with distance education and computer technologies, and several demographic variables that may be correlated with previous access to technology. We have operationalized these variables with the intent of providing a quantitative contrast to our contextual observations. **Communication apprehension** is defined as the student's reported

anxiety in communicating with others in three general contexts: dyadic encounters, small groups, and public speaking (Booth-Butterfield & Gould, 1986; Leary, 1991). In addition to these contexts, this study applied this definition to the use of distance education technology (e.g., anxiety over appearing on a television screen, listening to one's voice on tape, giving a presentation on television) (McMahon, Gantz, & Greenberg, 1995). **Technology attitudes** are defined as those perceptions and opinions about the various technologies used for this course. Student attitudes about the usefulness and ease of using video conferencing, computers, and computer software are plausible influences on their participation, achievement, and enjoyment. **Technical self-efficacy** is defined as students' perceptions of their own expertise with various types of computer software and hardware (e.g., word processing, spreadsheets, modems, the World Wide Web), as well as the frequency with which they use such programs and equipment.

Method

Setting

This study examines the use of distance education technology in a telecommunications course about the social and economic impacts of information technology. Course content focused on the effects of new technologies and an information-based economy on public policy, the home, the workplace, and the classroom. Aside from their readings in a study guide and various texts on information technology, students were asked to:

1. write personal reaction journals.
2. interview and write a paper about an information professional.
3. keep a log of information-related articles and events.
4. compose a lexicon of information-related terms on a topic of interest.
5. react to and evaluate an information retrieval exercise using library and on-line databases.

6. write a take-home final exam synthesizing a personal perspective on course materials and the student's chosen research topic.

On the first day of the course 58 students were enrolled; 49 of them finished the course. The originating site was a specially equipped television studio on the home campus. Two other on-campus sites included an academic conference room and a dormitory classroom. The bulk of students were on campus and rotated among the various on-campus sites during the semester. Five other students were enrolled at learning sites around the state. Broadcast of the class by local cable companies allowed some distant and on-campus students to attend class from home, calling in with questions or comments via a toll-free telephone number. The class met once per week for 150 minutes. A tenured professor taught the course and was assisted by an expert in educational technology and a graduate teaching assistant. Two broadcast engineers were charged with the technical arrangements for the course.

The course was delivered to all sites via two-way audio, one-way video teleconferencing for five weeks. For the remaining 10 weeks, all students (except three of the distant-site students) were connected by two-way video conferencing technology. Each site maintained its own camera and audio consoles which allowed students and instructors to manipulate the visual and audio information sent to the originating site. The participants also made use of an asynchronous computer conferencing system that allowed for collection of journal entries and their topic-related logs and lexicons. Students were asked to submit most assignments via email, computer conferencing, or fax. Instructors used the same system to provide feedback and grades. The instructors' office hours were conducted face-to-face for on-campus students and via phone or email for distant students. In addition, all participants were given access to an email distribution list that enabled them to send messages to all class participants at once.

Data Collection

All observation techniques were designed and conducted by two researchers who were not instructors or technical assistants in the course. Our theoretical focus and research variables suggested a multiple-

methods design that employed qualitative and quantitative procedures. Five principle methods were used:

1. In-class observations were conducted at the on-campus sites throughout the semester. On several occasions an observer sat in the distance education studio and control room at the originating site.
2. Quantitative surveys were used to measure students' attitudes toward the course technology, communication apprehension, and the frequency with which they used computers for a variety of purposes. These surveys were administered at the beginning and end of the course.
3. In-depth interviews were conducted with 25% of the students enrolled in the course, including two of the distant students. These interviews were conducted throughout the semester beginning with the fourth week of the course.
4. Students' journal entries, messages, and logs/lexicons were analyzed via access to the course computer conference and email distribution list. This provided access to all assignments except the students' final exam (the final paper in the course).
5. To provide a backup copy of class proceedings, each class session was taped from the studio's control room. These tapes only provided a record of what was broadcast during each course. Hence, they were not analyzed as part of this data, but were retained for use in verifying each session's agenda.

Participation Patterns

The introduction of two-way audio (and later video) conferencing equipment yielded particularly interesting patterns in the way that students interacted with the course instructors. One physical factor in this regard was the number of microphones available in each learning site during the first few weeks of the course. In most sites, students had to operate a telephone handset to speak with the originating site during class. Students in the academic conference room had 5-6 table microphones which could be operated by pressing a switch. Since not everyone had access to a microphone, some people would have to make extra efforts to speak with the instructor. Another factor affecting participation was the adoption

of "site facilitators," students who were responsible for initiating and moderating the small group discussions during class.

The result was that one person was charged with coordinating all of each group's communication with the originating site. This pattern emerged during the second class meeting. At one site a student asked a question about the instructor's explanation of an assignment. However, the student asked the question only of others in the room and made no attempt to use the telephone handset to ask the instructor directly. Several students debated whether or not to ask the question or try to use the telephone before anyone attempted to do so. Likewise in the conference room site, students often could be heard stating their questions about readings and assignments to the facilitator and sometimes telling that person to ask the professor. In subsequent weeks this pattern would take more wild turns. During one discussion segment on the changes technology has made in the home, work, and school, a group of students at one site debated when to break in to the discussion.

Student 1: "I'm not real partial to phone in. . ."

Student 2: "Should I call in?"

Student 3: "Just wait 'til they call on us."

Student 2: "That's right. . .Oh, Lord."

These patterns were firmly cemented halfway through the semester. During a full-class discussion in which an instructor is explaining how to connect to the Internet, a female student in the conference room asked a male student to clarify the instructions. When the male told her that she should use the microphone and ask the instructor, she adamantly refused. Though 20 people could hear her questions in the conference room, the thought of airing her question before students at the other sites clearly intimidated her. Each week's observations revealed new instances of students telling other students to ask a question about an assignment, a reading, or how to submit their work.

A second pattern that emerged from student-teacher interactions is the difficulty students experienced when trying to decide when to gain the teacher's attention during class. In traditional classrooms, of course, one expectation is that students raise their hands to "gain the floor." In turn, an instructor would wait for a convenient place to stop what she/he is saying and call on the student. This turn-taking process did not work with one-way video technology, however. To ask a question or make a comment, students had two options--wait for the instructor to ask if anyone wanted to speak or interrupt the instructor's statements. At the beginning of the fourth class meeting, for example, students in the conference room were unable to see the video signal from class. After much discussion about how they might be able to tell someone of their technical problem, a male student asked if he should just contact the instructor "on the air" with his microphone. Several students responded that he should wait until the professor is done talking. As the professor's comments extended, though, a female student said, "She would have to lecture first." Once the professor began lecturing, the male interrupted to tell her of the video problem.

This pattern did not disappear when the course began to use two-way video conferencing equipment. Students remained unsure as to whether or not anyone at the originating site could see what was happening in their rooms. Compounding this uncertainty was the fact that only one person could manipulate the camera and audio mute button at once. To gain recognition to speak, then, was a matter of first telling the controller to turn off the mute button, then using the omni-directional microphones to interrupt the professor.

These patterns only exacerbated communication problems with which many teachers are all too familiar. On several occasions when an instructor was attempting to explain an assignment, students at distant sites were engaged in fervent discussions about the requirements, grading criteria, submission procedures, and other details. As these discussions took place within a site, the instructor was often answering the same questions for students at other sites. In short, students' reluctance to use the distance

technology to gain recognition from the instructor resulted in some confusion and uncertainty in the communication of assignments and completion of group discussion activities.

Being "On Stage"

The technology introduced a second set of barriers to the kinds of classroom communication that many students expect in traditional environments. These barriers relate to the increased exposure students perceived when they appeared on camera or over a microphone during the class. This directly relates to students' anxiety about communicating in public settings. Nothing is more "public" than appearing on a television screen or sound speaker, particularly when one has been told that cable TV systems broadcast the course.

The foundations for these perceptions and potential anxieties could be observed during the first three weeks of the course, chiefly with on-campus students. Students rotated among the originating site (a TV studio) and two distant sites (i.e., sites connected by conferencing technology). During the second week of class, as a shot of students in the studio was shown on screen, students in the conference room laughed. As the laughter died away, one student remarked, "It looks like a talk show in there." Indeed, as people they knew appeared on screen, the slightest expression was greeted with chuckles. Stuffy noses and sniffles were audible and became topics of open discussion. Production glitches became a source of constant amusement. Coupled with these episodes, however, was the realization that at some point every student had to attend class in the studio. Therefore, everyone else soon may be laughing at the new "talk show audience." During most classes, the "studio audience" remained very silent throughout the evening.

With the two-way audio and one-way video, most students did not directly participate in discussions between the various learning sites. Comments in front of the entire class were infrequent or nonexistent. The third week of class presents an illustrative dialogue when an instructor asked each site to share their group comments with everyone.

Instructor: "Anyone want to chime in?"

Student 1: (to his/her site only) "Please, Jesus H. . ."

Student 2: No way.

Student 3: I'm not partial to this thing (the telephone handset).

While conversation flowed freely with closed microphones, open microphones usually meant silence within each learning site. The technology had formed a barrier to interaction among students at all sites.

Once the course implemented use of two-way video conferencing, however, distant sites were more frequently shown on screen. In fact, instructors sometimes conducted class from the conference room. As a result, students could appear on camera or on a sensitive, open microphone no matter where they were attending class. Those attending class in the conference room quickly learned to use the mute button on the video conference console, enabling them to interact freely with one another without being heard by instructors teaching in the studio. Anxiety also surfaced with the camera equipment. Students often "hid" from the camera by shielding their faces, moving their chairs, or simply sitting out of camera range.

One clear example of this was observed in the conference room during the eighth week of class. A male student was operating the video conferencing console and panned the camera around the room. As the camera paused on different individuals, two were noticeably affected. A female student saw her image on the in-room monitor and hid her face in her arms on the conference table. As the camera moved to another male student, he noticed his image and said, "Go away, dude!" Several weeks of observation notes contain references to similar episodes of "hiding" from the camera or ordering it away. In fact, beginning with the eighth week of class, students were observed entering the conference room and sitting in chairs out of the camera's pan range. At about the same time, one remote student, who became tired with appearing alone on camera, drew a picture of himself to show to the class. Though he could not control when his image was broadcast, the video conferencing console let him control what image was broadcast.

This attitude toward appearing on camera or over the microphones is a curious pattern considering the actual size of the course. Though students had no qualms about speaking in front of the 10-20 people in their own room, they were clearly hesitant to speak in front of the entire class of 49 students (not to mention a potential audience on two cities' cable television systems). It is also interesting to note the students' communication anxiety regarding these situations as measured on 11-point Likert scales at the beginning and end of the course. Eleven items pertaining directly to this "on-screen" anxiety are shown in Table 1. In many cases, mean responses to these items indicate no strong direction in response (mean scores between 4.0 and 6.9). On nine of these items, though, the change in mean response from the first to last class meetings indicates an increase in students' communication apprehension with this technology.

Television Viewing Rules vs. Classroom Rules

Perhaps the most significant difference in the communication environment between this distance course and a traditional classroom was the content of students' audible comments during class. As mentioned above, students openly commented on the look of the originating site on the distant sites' video monitors, with one student saying that the studio "looked like a talk show." Another student announced during the second class meeting that "learning from TV is boring--it's like watching Mr. Rogers." Late in the semester, students in the studio listened as laughter from the conference room group floated over the speaker about 2-3 seconds after the professor had made a joke. The in-studio students looked at the sound speakers with surprise and one male said to another student, "Laugh track."

Throughout the course, any segment of the course that revealed its "live and unrehearsed" nature was commented upon by students at distant sites. Any minor delay or misstep in the flow of the course (slides not appearing on cue, people sniffling with runny noses, and even the instructors' facial and verbal reactions to student comments) received audible evaluation. During the second week of class, students were heard commenting on the instructors' and other students' appearance, dress, and demeanor. When instructors looked confused or quizzical about someone's comment or question, several students would

comment or chuckle aloud. Students who, in their eyes of some classmates, participated too often or eagerly were audibly labeled "geeks." One of our impressions was that many behaviors which may go unnoticed in a traditional classroom become heightened or enlarged when presented on a television screen.

Perhaps more compelling, however, is the fact that these comments were made at all. Throughout the course, many students at distant sites felt no restraint in voicing their reactions to what was happening during class, to their grades on assignments, and to students at other sites. There is little doubt that in a traditional classroom, comments like "Boy, what a geek!" would never be uttered aloud. Without an instructor in these rooms, distant site students often seemed more like they were watching television than attending a college class. The comfortable furnishings of the conference contributed to this atmosphere as well. One result was that this site became a very informal social atmosphere, with students freely conversing about a variety of subjects, eating dinner during class, and commenting on the class while it was being broadcast.

The most interesting aspect of these verbalizations was the conversations that arose among groups of students at distant sites during class meetings. Students would often turn away from the television and the instructor to talk with others about a variety of topics. Though in some cases their conversations stemmed from the professor's comments or extended a discussion taking place among the entire class, these conversations were more often about matters unrelated to the course. On several occasions, these conversations became loud enough that students trying to pay attention to the television monitor felt compelled to turn up its volume. When these measures failed, the more studious members of the course would move closer to the television. At no point in our observations did any student openly ask or demand that others remain quiet during class. Instructors took on this role later in the semester. While some of the course's discussion topics (e.g., privacy issues and computer hacking) consistently drew lively participation, this conversation pattern was a consistent feature of distant sites in this class.

In short, then, the difference between traditional classrooms and this distance class is glaringly apparent in what can be called students' "exit behaviors." In a traditional classroom, students that disengage from material might daydream, draw in their notes, or on rare occasions begin talking with those next to them. In a distance class, students are free to engage in much more overt behavior, much of which is normally associated with watching television. These episodes suggest that these students had difficulty deciding which set of "rules" applied--those of a traditional classroom or those of home television viewing.

Conclusions

It seems clear that courses taught at a distance introduce a variety of forces that alter the communication and learning environment for all involved. A great deal of the literature on distance education defines technology as a tool for delivery of course content, gathering information about course topics, and completing assignments. It is equally clear that the students in this course ably constructed clear procedures for accomplishing many of the traditional tasks of learning. Left to deal with the technology themselves, students established their own practices of clarifying instructional material, gaining recognition from the instructors, and participating in class activities. If the standard of distance learning is to create a communicative environment that encourages personal interaction, though, several steps are suggested by the strategies used in this particular course.

The first challenge is to redefine the channel of communication. Participants' perceptions of the technology used to deliver instruction and complete course work constitutes their fundamental communication media during such an experience. Much of the literature on distance education views such technology as a tool for reaching new student populations, gathering information from a global range of sources, and streamlining course work. Students made it rather clear that in the initial weeks of a distance class, the technology is seen not as a tool, but as a barrier to their notions of how classroom communication should happen. For an instructor who has spent weeks or months preparing a such a

course, this disparity can be frustrating to say the least. As was evidence by this class, modifications in instruction can facilitate changes in the perception of the course and its technologies.

The difference between the first and second halves of this particular course is a good illustration. Students found themselves uncertain of how to perform even the most basic of tasks during the initial weeks of the class. Once procedures had been informally established for gaining attention, conducting discussion, and speaking with the professor, students had constructed an atmosphere in which class activities could be conducted. Included in this atmosphere, however, were communicative and social norms usually associated with home television viewing rather than the classroom. This was an unwelcome aspect of the learning environment, prompting instructors to maintain a presence in the on-campus conference room as well as the studio from which the course was broadcast. The result was a more constrained atmosphere for student-student communication, though interaction was more frequently on-task during class meetings.

A primary task in this situation is to get an accurate understanding of how students, instructors, and technical support professionals perceive the technology and its fit with the class (Burge, 1994). A full description of each technology's impact on the course, communication, and learning would seem in order (Perraton, 1987). Further, some thought must be given as to how students will handle the most basic communicative tasks of the class. This is where constructivist notions of scaffolding may be of greatest assistance to distance instructors. The uncertainty of basic communication practices with distance technology demands that teachers take the time to set students at ease and familiarize them with procedures for gaining attention, running discussion activities, and submitting work. As students and instructors become more familiar with each other, these practices can and will be modified to suit the changes in the learning environment. Further, all students can become familiar with the technology rather than just the "tekkies" who enroll in the class. In short, the scaffolding can be taken away to allow students the freedom to construct the course for themselves.

Beaudoin echoes this argument when he discusses the challenges of teaching adults through distance education. The traditional model of classroom education has left students trapped in what he calls "syllabism," or the tendency to focus on prescribed knowledge from the instructor's syllabus rather than pursuing new ideas. Sponder (1991) refers to this same concept as "blindering." When distance technologies constrain or subvert the communicative mechanisms that support syllabism (e.g., face-to-face instruction, lecture/discussion teaching, etc.), students are made responsible for a larger portion of their learning. For those who are unfamiliar with "self-study," this is a drastic change. Beaudoin argues that students must be eased into these practices. In part, this can be accomplished with the kinds of assignments these students were asked to complete. Further, this can be accomplished with guided instruction on how discussion sessions should progress, how students can speak during class, and how the technology is used. We would argue that this guidance should be extended to all forms of communication in distance courses. Familiarity, after all, breeds a sense of comfort that contributes to any learning atmosphere.

Particularly with new college students, the shift in power structures that accompanies distance education can be an intimidating part of education (Harasim, 1993; Hiltz, 1993; Laszlo & Castro, 1995; Thach & Murphy, 1994). While some unquestionably respond to the challenge of guiding their own education, others clearly abdicate such responsibility. Common to all of these reactions is an initial period of "floundering," during which students can feel confused and frustrated with a new system of communication. The goal for distance instructors, then, is to ensure that this period is one of "controlled floundering" that eventually guides students to an understanding of both the class and the technical aspects of its learning environment. With this guidance, students may be given enough confidence to assume control for themselves, constructing an educational experience that benefits all involved.

This paper has attempted to describe some of the changes that distance education technology introduces in classroom communication. It is clear, at least to us, that when such technologies are used,

fundamental parts of the communication process are altered (e.g., communication channels, routine practices of interaction, and social norms within the classroom). It is impossible to conclude that when communication changes so radically, traditional learning styles will still apply to distance learning. Many theoretical models of distance education do not fully account for this change, adopting objectivist principles of learning without fully adapting them to such contexts. Theoretical models which stress the communicative and dialogic elements of distance learning are helpful, but an adequate theory must be able to understand each course's unique, local context. We argue that only in this way can research contribute to the study of learning at a distance.

Table 1. Students' willingness to communicate in class and through the use of distance technology.

Survey Item	Week 1	Week 15
I think hearing recordings of my voice is fun.	**4.60**	**4.09**
I feel uncomfortable listening to recordings of my own voice.	**4.25**	**5.42**
I feel embarrassed when others listen to me on tape.	**3.88**	**4.39**
I dislike having my picture taken.	**2.45**	**3.44**
I think seeing my own face on the TV screen is fun.	**5.69**	**5.33**
I feel comfortable seeing myself on video.	**6.00**	**5.86**
I feel embarrassed when others see me on video.	**3.17**	**3.5**
I am very calm and relaxed when called upon to speak on video conferencing.	**6.29**	**5.91**
I'm embarrassed about how I appear to those on the other end of the video conference.	3.51	2.86
I am willing to ask questions during class.	**6.65**	**6.31**
I am willing to voice an opinion during class.	6.65	7.14

Note: Scores are mean responses to these items. Items in boldface indicate that the direction of difference in means shows an increase in communication anxiety or inhibition. Subjects were asked to indicate their agreement with each statement on an 11-point Likert scale, with zero meaning no agreement at all and ten meaning complete agreement.

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